

INTERNATIONAL PRELIMINARY EXAMINATION REPORT



(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TBS/37402WOP	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/GB 03/04470	International filing date (day/month/year) 14.10.2003	Priority date (day/month/year) 14.10.2002
International Patent Classification (IPC) or both national classification and IPC F16C29/00		
Applicant PIKE, Anthony Bruce		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

- This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 12.05.2004	Date of completion of this report 31.01.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer De Jongh, C Telephone No. +49 89 2399-8667 

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB 03/04470

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

2-4, 6	as originally filed
1	received on 15.05.2004 with letter of 12.05.2004
5, 7	received on 15.01.2005 with letter of 04.01.2005

Claims, Numbers

1-7	received on 15.01.2005 with letter of 04.01.2005
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Drawings, Sheets

1/8-8/8	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☒ the description, pages: 8
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	1-7
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations

see separate sheet



With Respect to Item V (reasoned statement)

1. Document US 2 192 821 A (**D2**), which relates to rescue stretchers and is therefore considered to represent the most relevant state of the art with respect to claim 1 in view of the application as a whole, essentially discloses (cf. page 1, right column, line 8 to page 2, left column, line 42 and figure 4) a bearing comprising:
 - a frame (1), and
 - two layers of a plurality of spheres (3) (as well as rollers) in respective parallel single planes, whereby
 - the spheres (3) of one plane project beyond the frame (1) on one side of the frame and the spheres of the other plane project beyond the frame on the opposite side of the frame,
 - the spheres (3) are constrained to be retained in the same relative positions with respect to the frame during rotation (cf. wires or rods 4).
2. The invention differs from the bearing disclosed in document **D2** in that:
 - a) the two layers of a plurality of spheres are provided as **two matrices** each of a plurality of spheres,
 - b) the frame at least partly **surrounds the two matrices**, and
 - c) the spheres of one matrix are located so as to lie at least mostly against the spheres of the other matrix so that rotation of the spheres of one matrix results in counter-rotation of the spheres of the other matrix.
3. Due to the fact that the spheres of the two layers mutually drive each other (cf. feature c) above) the bearing as defined in claim 1 can be easily slid between two bodies, e.g. in case of a rescue stretcher which is moved between the ground and a person lying thereon.
4. Document US 4 860 875 A (**D1**) discloses (cf. column 3, lines 1 to 28 and figure 2) a conventional conveyor type bearing comprising:
 - a base body (1), consisting of a support member (11) and a cover member (3) and
 - two layers of a plurality of spheres (8, 13) in respective parallel single planes, whereby
 - the spheres (8) of one layer are located so as to lie at least mostly against the spheres (13) of the other layer so that rotation of the spheres (8) of one layer results in counter-rotation of the spheres (13) of the other layer.
 - the spheres (8) of one plane project beyond the frame (1) on one side of the

- frame,
- the spheres (8, 13) are constrained to be retained in the same relative positions with respect to the base body (3, 11) during rotation
5. As exemplified by document **D1** it is well known to support the spheres of a ball conveyor on smaller spheres to support the conveyor balls with respect to the conveyor body, whereby rotation of the larger spheres results in counter-rotation of the smaller spheres (cf. feature c) above). The smaller spheres serve to **support** the larger spheres with rolling contact with respect to the pockets in the conveyor body.
- However, it is not considered obvious to transfer the counter-rotation which is known per se for the **support** of spheres in a conveyor, where **one** body moves along a conveyor way to a bearing in a rescue-stretcher, as e.g. known from document **D2**, where a bearing body is slid between **two** bodies on two layers of rolling elements.
- Furthermore, the two layers of spheres should be provided as **two matrices** each of a plurality of spheres, whereby a frame at least partly **surrounds the two matrices**. Neither document **D1** nor document **D2** discloses such a frame surrounding two matrices.
6. Dependent claims 2 to 7 relate to preferred embodiments of the bearing defined in claim 1.
7. As is clear from the discussion of documents **D1** and **D2** above the present two-part form of claim 1 (delimitation with respect to document **D1**) is not correct (Rule 6.3(b) PCT).
8. The last paragraph of page 1, was not adapted to new claim 1 (Rule 5.1(a)(iii) PCT). The claims and text relating to figures 10 to 12 were deleted, however, the first two lines of page 5 should apparently not have been deleted.
9. The above mentioned documents **D1** and **D2** have not been indicated and discussed in the description (Rule 5.1(a)(ii) PCT).

PCT

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- However, it is not considered obvious to transfer the counter-rotation which is known per se for the **support** of spheres in a conveyor, where **one** body moves along a conveyor way to a bearing in a rescue-stretcher, as e.g. known from document **D2**, where a bearing body is slid between **two** bodies on two layers of rolling elements.
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CLAIMS

JC13 d PCT/PTQ 14 APR 2005

1. A bearing comprising a frame (2) at least partly surrounding two matrices (12, 16), each of a plurality of spheres (10, 14), each matrix when flat having its spheres mounted for rotation in substantially a single planar or at least part spherical plane, the plane of one matrix being parallel to that of the other matrix, the spheres of one matrix located so as to lie at least mostly against the spheres of the other matrix so that rotation of spheres of one matrix results in counter rotation of spheres of the other matrix, characterised in that the spheres of the one matrix are arranged to project from one side of the frame and the spheres of the other matrix are arranged to project from the opposite side of the frame, the spheres of each matrix being constrained to be retained in the same relative position with respect to the frame during rotation.
2. A bearing according to claim 1 wherein the spheres are between 25 mm and 15 mm in diameter.
3. A bearing according to claim 1 or 2 further comprising an inflatable platform (22) arranged to be detachably joined to the bearing.
4. A bearing according to claim 3 wherein the inflatable platform is provided with detachable poles (26) disposable on either side of the platform and so arranged for carrying the platform.
5. A bearing according to claim 1 wherein the spheres are between 2.5 and 7.5 mm in diameter.
6. A bearing according to claim 1 or 5 wherein the spheres are woven into each matrix (Figures 5 and 6).
7. A bearing as claimed in claim 1 wherein the matrices are curved in one or more planes.

12 May 2004

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LINEAR BEARING

The present invention relates to linear bearings.

5 Linear bearings are used for a number of purposes, for instance ball conveyors as shown in GB Patent No 543,524 (Curran) and GB Patent No 1,263,456 (NRDC). The principle of ball conveyors has been used for moving loads such as boxes or workpieces and also for patients in a hospital.

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The present invention is also designed in different forms to cope with the problem of moving objects of the same width as above including heavy structures like bridge components as well as for handling patients.

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Rescue stretchers are either rigid or flexible and are normally placed to one side of a patient who is then lifted or rolled (termed "logrolled") on to the stretcher. Both methods of placing the patient on the stretcher are dangerous since spinal injuries can be aggravated by the action of lifting or rolling. In order to prevent further injury where spinal injury has already occurred, it is clearly necessary if possible to move the patient onto a stretcher without disturbing the patient, particularly moving the patient's head relative to the rest of the patient's body.

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A linear bearing according to the present invention comprising a frame, at least partly surrounding two matrices, each of a plurality of spheres, the spheres of one matrix located so as to lie at least mostly against the spheres of the other matrices so that rotation of spheres of one matrix results in counter-rotation of spheres of the other matrix, characterised in that the spheres of each matrix project beyond the frame and are constrained to be retained in the same relative positions with respect to the frame during the counter-rotation.

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Figure 9 is an exploded perspective view of the platform of Figure 8;

Figure 10 is a diagrammatic view of another embodiment of the invention showing a spherically linear bearing and a rectilinear bearing;

Figure 11 is a diagrammatic side view of a resilient linear bearing according to an alternative embodiment of the invention; and

Figure 12 is a diagrammatic view of a rotatable or rectilinear movable bearing according to a still further embodiment of the invention.

The bearing in the form of a mat of Figure 1 is formed with a frame 2 made of a flexible plastics material having a chamfered edge 4 and supporting an upper perforated sheet 6 and a lower perforated sheet 8. The upper perforated sheet locates a plurality of spheres 10 and together they form a first matrix 12. The lower perforated sheet 8 locates rows of spheres 14 which form a second matrix 16. The upper rows of spheres 10 of the first matrix seat on the lower spheres of the second matrix in such a way that most of the upper spheres each are supported on four lower spheres.

The upper spheres 10 located in perforations 18 of sheet 6 are such as to allow free rotation of spheres 10. Similarly, perforations 20 in lower sheet 8 allow free rotation of spheres 14. Since the upper spheres are seated on the lower spheres, any rotation of the lower spheres will cause counter rotation of the upper spheres. In this way, any movement of bearing 1 when placed on the ground will cause the upper spheres to move in the opposite direction to the bearing.

The spheres 10 and 14 are preferably made of hard plastics

either used to transfer a patient from a stretcher on to the bed or else pulled under the patient so that the patient can be lifted off the bed for changing sheets. For this purpose the spheres 50 (see Figures 5 and 6) are about 5 mm in diameter or less. The bearing for this embodiment is formed by threading the spheres on sacrificial thread 52 and weaving the threaded spheres into a matrix, then dissolving the sacrificial thread to leave the spheres rotatably supported by the weave 54 of the woven matrix.

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Figure 7, 8 and 9 show a substantially rigid composite plate 60 incorporating the bearing of the invention in which a first matrix 62 of spheres 61 is located above a second matrix 64. Each matrix is carried in a perforated sub plate 65, 65' which are secured together as shown in Figure 7.

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In Figure 9 there can be seen telescopic arms 70 which attach by means of ball joints 72 and brackets 74 to the top sub plate 65'. These arms are designed to push the plate 60 under an article, in particular an injured person, so that the person is not subject to injurious movement whilst being transferred from one location (e.g. an accident site) to another (e.g. an ambulance). Carrying handles (not shown) can be provided on the plate.

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Figure 10 is a diagrammatic view of, for instance, a ship to shore gangway or vehicular connection between shore and pontoon - the relative movement between ship and shore is similar to that between pontoon and shore. In this case, the shore is shown at 80 and pontoon at 82. Between shore and pontoon is a "bridge" 84 which has a semi spherical bearing surface 85 at one end and a bearing plate 86 mounted at 87 to the bridge.

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The bearing surface 85 fits over a spherical plate 88 of spheres 89 of, say, between 2.5 and 7.5 mm held in two matrices 90 and 92. Matrices 90 and 92 are fixed to semi

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